

Chapter 10 Volcanoes and Other Igneous Activity

Summary

10.1 Volcanoes and Plate Tectonics

➡ Magma forms in the crust and upper mantle when solid rock partially melts. The formation of magma depends on several factors, including heat, pressure, and water content.

- When hot yet solid mantle rock is less dense than the surrounding rock, it rises, decreasing the pressure on the rock. This lowers the rock's melting point, allowing **decompression melting** to occur.

➡ Most volcanoes form along divergent and convergent plate boundaries. Some volcanoes form far from plate boundaries above “hot spots” in the crust.

- At divergent boundaries, volcanic activity occurs where the plates pull apart.
- The **Ring of Fire** is the long belt of volcanoes that circles much of the Pacific Ocean.
- Volcanic activity within a plate is called **intraplate volcanism**.
- A small volcanic region a few hundred kilometers across that forms above a mantle plume is called a **hot spot**.

10.2 The Nature of Volcanic Eruptions

➡ The primary factors that determine whether a volcano erupts explosively or quietly include characteristics of the magma and the amount of dissolved gases in the magma.

- **Viscosity** is a substance's resistance to flow.
- A **vent** is an opening to the Earth's surface. During explosive eruptions, the gases trapped in magma push the magma out.

➡ Depending on the type of eruption, volcanoes may produce lava flows or eject pyroclastic materials, or both. All volcanic eruptions also emit large amounts of gases.

- Particles from volcanic eruptions are called **pyroclastic materials**.
- The fragments ejected during eruptions range in size from very fine dust and ash to pieces that weigh several tons.

➡ The three main volcanic types are shield volcanoes, cinder cones, and composite cones.

- Repeated eruptions of lava or pyroclastic material eventually build a mountain called a **volcano**.

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- Located at the summit of many volcanoes is a steep-walled depression called a **crater**.
- **Shield volcanoes** are produced by the accumulation of fluid basaltic lavas and have the shape of a broad, slightly domed structure.
- A **cinder cone** is a small volcano built primarily of pyroclastic material ejected from a single vent.
- A **composite cone** is a large, nearly symmetrical volcanic mountain composed of layers of both lava and pyroclastic deposits.

➤ **Volcanic landforms also include calderas, volcanic rocks, and lava plateaus.**

- A **caldera** is a depression in a volcanic mountain.
- A **volcanic neck** is a landform made of magma that hardened in a volcano's pipe and later was exposed by eruption.
- A **lava plateau** is a volcanic landform produced by repeated eruptions of very fluid, basaltic lava. Instead of building a core, the lava spreads out over a wide area.

➤ **Volcano hazards include lava flows, volcanic ash, pyroclastic flows, and mudflows.**

- A **lahar** occurs when water-soaked volcanic ash and rock slide rapidly downhill.

10.3 Intrusive Igneous Activity

➤ **Types of plutons include sills, laccoliths, and dikes. Geologists classify plutons and other bodies of intrusive igneous rock according to their size, shape, and relationship to surrounding rock layers.**

- The structures that result from the cooling and hardening of magma beneath Earth's surface are called **plutons**. Uplift and erosion can expose plutons at the surface.
- A **sill** is a pluton that forms where magma flows between parallel layers of sedimentary rock.
- A **laccolith** is a lens-shaped pluton that has pushed the overlying rock layers upward.
- A **dike** is a pluton that forms when magma moves into fractures that cut across rock layers.

➤ **A batholith is a body of intrusive rock that has a surface exposure of more than 100 square kilometers.**

- Batholiths are the largest bodies of intrusive igneous rocks.